Xiaoyu Yan

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Education

Northwestern University — Evanston,IL
Ph.D. Transportation System Analysis and Planning — *Expected Jun. 2028*

University of Illinois at Urbana-Champaign — Urbana, IL
B.Sc. Civil Engineering, GPA:3.91/4 — *May. 2023*

Zhejiang University — Zhejiang, China
B.Eng. Civil Engineering, GPA:3.98/4 — *Jun. 2023*

Technical Skills

AI Agent: agentic AI, multi-agent LLM, RAG, SFT, post-training, tool-use agent, synthetic data generation
Data Science: statistical modeling, machine learning (PyTorch, scikit-learn), deep reinforcement learning
Language & Tools: Python, C++, JavaScript, R, MySQL, MATLAB, Git, Docker, LaTeX, ArcGIS

Experience

Northwestern University | Center for Connected and Automated Transportation — Evanston, IL
Graduate Researcher — *Sep. 2023 – Present*

- Process **4.6 million** GPS data entries with **Python and SQL**, define the metrics to extract activities and classify worker types based on spatio-temporal patterns by **hierarchical clustering** algorithm, improve accuracy by 8%
- Formulate models (K-Means, DBSCAN) using **Scikit-Learn** to classify transportation modes from GPS data
- Use **random forest** to predict the transit service index (TSI) based on derived features, achieving **80% accuracy** compared with the survey-based result, producing an automated way for TSI evaluation
- Built a **RAG-enhanced synthetic population pipeline** combining mobile phone data and DMACS marginals for nonparametric transit insecurity prediction and trip-chain reconstruction
- Built a stylized, **joint optimization** model for the fixed-route transit and paratransit operations for resource allocation, delivering policies that minimize total travel time within budget constraints
- Stress-tested fleet plans for Chicago by calibrating parameters and running sensitivity analyses on vehicle capacity and multi-period demand, **identifying fleet operation plans** and time-cost trade-offs for **planning decisions**

Alibaba-Zhejiang University Joint Research Institute — Zhejiang, China
Applied AI Scientist Intern | Institute of Frontier Technologies — *Sep. 2021 – Jun. 2023*

- Built a city-scale **trip-chain reconstruction** pipeline from sparse GPS data with DBSCAN and Random Forest
- Developed a **multimodal travel-mode identification** workflow with feature engineering and AdaBoost classifier, achieving strong performance across modes and **93.5% metro identification accuracy**
- Implemented a link-level CO_2 accounting framework with sample expansion and emission-factor modeling, and built a **cloud-backed interactive platform** for real-time, multi-scale emissions **monitoring over 9.19M records**

The Architectural Design & Research Institute of Zhejiang University — Zhejiang, China
Structure Engineer Intern — *Jul. 2021 - Sep. 2021*

- Conducted **structural design** of a resettlement community and **engineering drawings** with **AutoCAD**
- Completed **3D modeling** and load calculation for the project, conducted safety check and delivered the design

Projects

Large Language Model for Automated Transportation Policy Making — *Nov. 2024 – Oct. 2025*

- Built an **LLM-driven agent-based decision platform** to simulate citywide transit policy referendum; compared scenario-driven voting outcomes and surfaced cross-neighborhood and cross-city differences in policy preferences
- Integrated a calibrated **utility-based transit design model** to provide performance signals and benchmark outcomes (utility, Gini, mode share) for **alignment checks**, validated the potential of LLM for policy making
- Evaluated LLM voting behavior via regression modeling; executed prompt ablation tests to benchmark robustness

Fairness-Enhanced Deep Learning in Travel Demand Prediction — *May. 2023 – Sep. 2023*

- Built a fairness-aware **spatiotemporal neural network** (STGCN) for Chicago travel-demand forecast
- Added an equality-enhancing loss to reduce demographic/spatial disparity, **improving fairness up to 48%**

Travel Behavior Study on Citi Bike Users in New York City *Jun. 2022 – Aug. 2023*

- Analyzed NYC Citi Bike data to quantify user behavior shifts across COVID with **statistical validation**
- Built a station-level clustering pipeline with **Gaussian Mixture Model** and fused Points-of-Interest data to distinguish commuting vs. leisure clusters and translated findings into operational strategies

On-Demand Autonomous Shuttle Preferences & Operations Research *Nov. 2022 – Aug. 2023*

- Designed **revealed and stated preference surveys** as scenario-based choice experiments to quantify commuter adoption of on-demand shared autonomous electric shuttles
- Developed a **hybrid choice mode**l (Structural Equation Model + Mixed Logit) to capture latent psychological preferences and heterogeneous cost/time elasticities, producing actionable insights for service and operations design

Publications & Conferences

[1] **Yan, X.**, Dai, T., Nie, Y. Addressing the alignment problem in transportation policy making: an LLM approach. Presented at *NeurIPS 2025 Workshop Responsible and Trustworthy Foundation Models.*

[2] **Yan, X.**, Zheng, H., Nie, Y. Joint design of fixed-route and paratransit services with autonomous pods. presented at the *Transportation Research Board 104th Annual Meeting*, Washington, D.C. Presentation Number: TRBAM-25-05686, 2025.

[3] Dong, Z., Chen, C., Ouyang, J., **Yan, X.**, Liao, C., Lee, D., Chen, X. Understanding commuter preferences for on-demand shared autonomous electric vehicles. *Transportation Research Part D: Transport and Environment*, 140, 104621.

[4] Wang, K., **Yan, X.**, Zhu, Z., & Chen, X. M. (2024). Understanding bike-sharing usage patterns of members and casual users: A case study in New York City. *Travel Behaviour and Society*, 36, 100793.

[5] Liu, J., Li, J., Chen, Y., ..., **Yan, X.**, ..., Chen, X. (2023). Multi-scale urban passenger transportation CO_2 emission calculation platform for smart mobility management. *Applied Energy*, 331, 120407.

[6] Lai, D., Lin, L., **Yan, X.**, Li, Z., Xu, K., Demartino, C., Xiao, Y. (2021). Development of a Steel Fiber-Reinforced Rubber Concrete for Jacket of Bridge Piers Against Vehicular Impacts: Preliminary Results. In *International Conference of the European Association on Quality Control of Bridges and Structures* (pp. 1144–1151). Springer, Cham.

Leadership

President | Northwestern Transportation Club *Sep. 2025 - Present*

- Organize monthly events for 50+ members; manage budget applications and account reconciliation
- Forge the partnership with industry, and coordinate site visits, e.g. Amazon, Chicago DOT, and CTA, etc

Board Member | ASCE Student Chapter at Zhejiang University *Jun. 2022 - Jun. 2023*

- Organized and hosted professional seminars Civil Talk and campus-scale structure competitions

Teaching Experience

Teaching Assistant for CIVENV 205: Economics and Finance for Engineers *Sep. 2022 - Jan. 2023*

- Developed recitation materials and homework solutions; led weekly discussions for 60+ students
- Provided project support; designed, proctored, and graded exams

Teaching Assistant for CEE 201: System Engineering & Economics *Sep. 2022 - Jan. 2023*

- Led weekly discussion sections and provide project consultant on traffic assignment and TSP- problems

Teaching Assistant for ENGR100: Engineering Orientation *Sep. 2021 - Jan. 2023*

- Coordinated course logistics for 500+ students, led weekly group discussions, and developed the course website

Honors & Awards

- **Cabell Fellowship, Northwestern University** (Selected as one of 10 fellows university-wide) *2023*
- **Outstanding Graduate Award, Zhejiang Province & Zhejiang University** (Top 3%) *2023*
- **China National Scholarship** (Top 1% nationwide) *2022*
- **Dean's List, University of Illinois Urbana-Champaign (UIUC)** *2022*